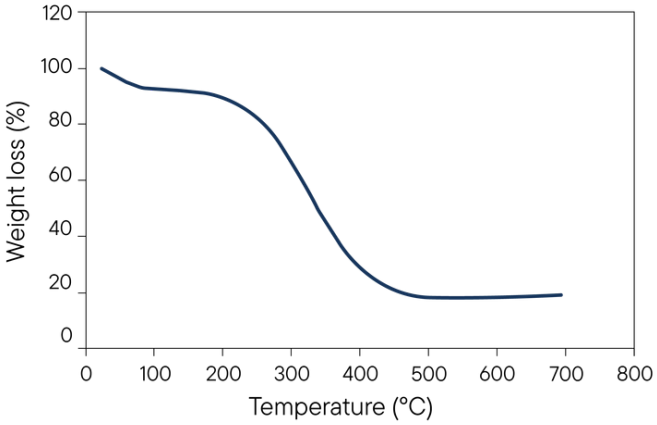
Thermal Stability of Natural Adsorbents for Oil-Contaminated Water Treatment

Simultaneous Thermal Analysis of Anise Residues (ARs)

Simultaneous Thermal Analysis (STA) enables the combined measurement of mass change and heat flow under controlled temperature conditions. In this application example, anise residues (AR) were investigated using the former instrument designation STA PT 1600, now known as the Linseis STA L81.
The measurement provides valuable information about moisture release, thermal decomposition, and residual stability of the adsorbent material across a wide temperature range.

Measurement Setup

- Instrument: Linseis STA L81 (former designation: STA PT 1600)
- Sample: Anise Residue (AR)
- Atmosphere: Nitrogen
- Heating Rate: 5 K/min
- Temperature Range: Ambient to 900 °C
- Measurement: Simultaneous mass change and heat flow determination



The STA measurement reveals the thermal decomposition behavior of the investigated adsorbent material.
Key observations include:

- Initial mass loss below approximately 200 °C
- Main decomposition stage between 250 °C and 500 °C
- Significant degradation of organic components
- Stable residual fraction above approximately 500 °C

The remaining mass indicates the presence of thermally stable carbonaceous components.

Interpretation

The observed mass loss can be attributed to:

- Moisture release
- Organic decomposition
- Volatile component evolution

This results in:

- Formation of stable carbonaceous residue
- Good thermal stability at elevated temperatures

Industrial Relevance

STA measurements are widely used for:

- Adsorbent characterization
- Sorption material development
- Thermal stability analysis
- Regeneration studies
- Process optimization

Conclusion

The measurement performed with the Linseis STA L81 demonstrates the suitability of simultaneous thermal analysis for investigating the thermal stability and decomposition behavior of natural adsorbent materials. The combination of mass change and heat flow information provides valuable insights for material development and environmental applications.

Source:
Al-Najar, J. A., Al-Humairi, S. T., Lutfee, T., Balakrishnan, D., Veza, I., Soudagar, M. E. M., Fattah, I. M. R.
"Cost-Effective Natural Adsorbents for Remediation of Oil-Contaminated Water"
Water 2023, 15, 1186
DOI: 10.3390/w15061186
Adapted and extended with measurements performed on a Linseis STA L81 (former designation: STA PT 1600).